# Transforaminal vs. interlaminar lumbar epidural steroid injection and progression to lumbar surgery

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## BACKGROUND

Transforaminal and interlaminar epidural steroid injection are used interchangeably for lumbar radicular pain, and systematic reviews report approach-level equipoise for pain and function.

Whether approach alters progression to lumbar surgery had not been examined in a large comparative cohort. Studies in EHR data are vulnerable to artifact: the transforaminal injection also serves as a diagnostic selective nerve root block during operative planning.

## OBJECTIVE

Compare transforaminal vs. interlaminar/caudal injection on progression to lumbar decompression or fusion, in two separate pathology strata.

## METHODS

Retrospective cohort, TriNetX US Collaborative Network, first lumbar ESI 2016–2022, assigned by approach.

Two mutually exclusive strata analyzed separately: disc herniation with radiculopathy, and lumbar spinal stenosis. Exclusions: any epidural injection within 365 days or before 2016, any prior lumbar decompression/fusion, no baseline outpatient encounter.

1:1 propensity matched on 28 covariates (threshold 0.1). Outcome: lumbar decompression or fusion over days 31–365 and over sequential intervals to two years.

Days 366-730 treated as a negative-control period to set the residual-confounding floor.

## RESULTS

Matching yielded 7,530 pairs for herniation and 28,493 for stenosis (every SMD ≤ 0.014). The apparent transforaminal excess is concentrated in the first 90 days.

**1.70 →1.0**

### Herniation: excess then decay

Herniation composite RR decays from the first 90 days to null by six months

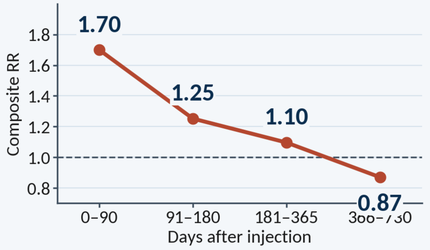



*Fig 1. Composite RR 1.700 (0–90d) → 1.252 → 1.096 → 0.870. Gone by six months.*

**1.34 →1.0**

### Stenosis replicates the decay

Stenosis reproduces the same decay curve in an independent 28,493-pair population

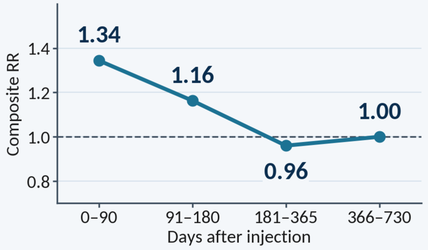



*Fig 2. Composite RR 1.344 → 1.163 → 0.960 → 1.000. Day 366–730 RR exactly 1.00.*

**2.9 ×**

### Early fusion is the tell

Fusion within 90 days is the smoking gun, then null in every later window

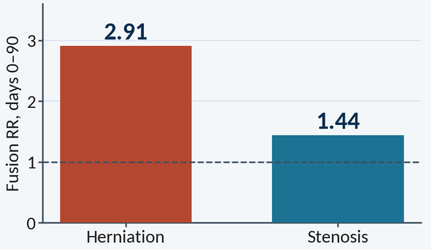



*Fig 3. Fusion 0–90d RR 2.913 (herniation), 1.440 (stenosis); null in every subsequent window. Pre-op level confirmation.*

**1.37 RR**

### Conventional window (12 mo)

Conventional day-31 window masks the time course: the excess is real but front-loaded

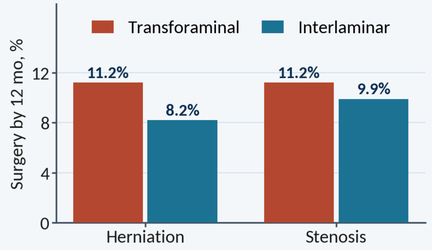



*Fig 4. Day 31–365 composite 11.2% vs 8.2% (herniation), 11.2% vs 9.9% (stenosis). The blanking period matters.*

## CONCLUSIONS

The apparent transforaminal disadvantage is generated almost entirely within the first ninety days and is largest for fusion, **the pattern expected when the injection serves as preoperative level confirmation rather than failed treatment**. Beyond six months the approaches are indistinguishable in both indications, with the day 366–730 stenosis composite RR at exactly 1.00 across 25,000 per arm.

**Methodological message: comparative studies of procedural interventions in administrative data require an adequate blanking period, or they will report substantial spurious effects.**

## KEY REFERENCES

1. Koltsov et al. ESI and subsequent lumbar surgery (MarketScan, 179,025 patients). 16.9% operated by 1 year.

2. 2025 AAN systematic review: approach-level equipoise for pain and function.

## CONTACT

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*Scan for the full abstract and contact details.*

*Devoid of patient-identifiable information; exempt from IRB review per Tulane University School of Medicine policy. Epidural corticosteroid is an off-label indication; no drug was administered for this retrospective analysis.*